REMARKS

The present application includes pending claims 1-8, 10-19, and 21-23, all of which have been rejected. It is respectfully submitted that the pending claims define allowable subject matter.

Claims 1-6, 8, 10-17, 19, and 21-23 stand rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,315,723 ("Robinson") in view of United States Patent No. 5,980,459 (Chiao). Claims 7 and 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson and Chia in view of United States Patent No. 5,873,830 (Hossack). The Applicants respectfully traverse these rejections, at least for the reasons set forth below, and previously during prosecution of the present application.

The Office Action states the following:

> Robinson et al discloses of an ultrasound imaging method where the first T_{S1} and second T_{S2} ultrasound beams are transmitted along a common scanline into a region of interest (ROI) and receiving reflected echoes (R_{L1} and R_{L2}, R_{S3} and R_{S4}) and multiplying (via multipliers 42, 44, and 46) the first and second echoes with weighting factor. The weighting process includes contribution from the number of scanlines used to form the composite image. The weighted echoes of signals are combined or added to form a composite image (col. Col. 5, line 56 – col. 6, line 46; col. 9, lines 31-61).

February 8, 2005 Office Action at page 2. The Applicants note, however, that the Office Action does not cite anything from Robinson (or Chiao for that matter) related to "summing said first and second weighted echoes **along said entire scan line** to form a composite scan line in an ultrasound image," as recited, for example, in claim 1 of the

present application. As a side note, the Applicants also note that the Office Action later concedes that "Robinson et al do not explicitly disclose or imply that the summation or combination of multiple signals involves weighting factor to form weighted echoes." *Id.* at page 3.

As noted above, the Office Action cites Robinson Column 5, line 56 to column 6, line 46 to reject claim 1. This passage reads, in part:

> The echoes are coupled to a beamformer 16 where they are appropriately delayed and combined to form coherent echo signals along each received scanline. In a conventional ultrasound system these scanline echo signals are filtered by a filter 22, detected by a detector 24 or Doppler processed by signal processor 26, then arranged into an image format by an image processor 28. The image signals are then displayed on a display 30.

Robinson at column 5, lines 48-64. However, there is nothing in this passage that leads one to conclude that "first and second weighted echoes [are combined] along said *entire* scan line to form a composite scan line in an ultrasound image," as recited, for example, in claim 1 of the present application. At best, this portion states that the "echoes are coupled to a beamformer 16 where they are appropriately delayed and combined to form coherent echo signals along each received scanline." *Id.* at column 5, lines 56-58. Again, however, this citation does not state that the echoes are combined along the *entire* scan line.

Robinson also states the following:

> Prior to being combined the echo signals of the respective beams are locationally aligned by time variable delays 52, 54 and 56 and appropriately weighted by weighting circuits comprising multipliers 42, 44, and 46, to which time variable

> weighting functions... are applied from coefficient stores 32, 34 and 36. The delayed and weighted r.f. echo signals from the multiple scans of the scanline are coherently combined by a summing circuit 48 to produce a composite scanline which synthesizes the effect of a dynamic transmit focus. The effect of the weighting circuits is to weight the relative contributions of the echo signals from the three beams to the composite scanline. Preferably this weighting is functionally related to the transmit aperture and the distances of each echo signal from its respective transmit focal point and the other focal points used in the combination process. The effect of the delays is to locationally align the r.f. echo signals being combined so that possible phase cancellation resulting from the combination of locationally mismatched signal data is reduced and preferably minimized.

Id. at column 6, lines 23-42. Once again, however, there is nothing within this passage that would lead one to conclude that "first and second weighted echoes [are combined] along said *entire* scan line to form a composite scanline in an ultrasound image," as recited, for example, in claim 1 of the present application.

Robinson later clarifies how the echoes are combined with respect to a scan line distance:

> There are several aspects of the present invention which make possible such improvement. One is that two scanlines are not simply butt-fit segments or segments cross-faded at the zone boundary as in the prior art. Instead, echoes over a ***substantial portion*** of the scanlines are processed and combined. ***Preferably*** echoes are combined over ***at least half of the distance (depth) from one focal point to the next.*** The characteristic shown in FIG. 5 results from the

> processing and combining of echo signals over the ***full distance from focal point 72 to focal point 74.***

Id. at column 4, line 59 to column 5, line 1 (emphasis added). The system and method of Robinson combines echoes over a ***substantial portion***[1] of the scan lines. In particular, echoes are combined over ***at least half of the distance from one focal point to the next.*** The distance from one focal point to the next is not the entire distance of the scan line. Even if echoes were combined over the entire distance from one focal point to the next, that distance still would not be the "entire scan line."

In fact, Robinson further emphasizes that only portions of scan lines, but not scan lines in their entireties, are used:

> A preferred embodiment of the present invention, as discussed above, combines scanline ***segments*** which spatially overlap for an appreciable range, ***generally at least half the distance between focal points and preferably for the full distance between focal points*** as illustrated in FIGS. 5, 6a, and 6b.

Id. at column 8, line 63 to column 9, line 1 (emphasis added). The Applicants note that a segment is a portion of a whole. Webster's Collegiate Dictionary, 10th Edition, defines a segment, inter alia, as "a separate piece of something... one of the constituent parts into which a body, entity, or quantity is divided or marked off by or as if by natural boundaries...."

The Applicants respectfully submit that Robinson clearly discloses that echoes over only portions, or segments, of scan lines are combined. At most, echoes over ***segments***, which are constituent parts, of a scan line from focal point to focal point, are

[1] As previously discussed, a portion, by definition, is not a whole, even if the portion is "substantial."

combined, as clearly stated at column 8, lines 63 to column 9, line 1. Thus, the Applicants respectfully submit that Robinson does not teach, nor suggest, "combining said first and second echoes along said entire scan line to form a composite scan line in an ultrasound image," as recited, for example, in claim 13 of the present application; nor does Robinson teach, or suggest, "combining said first and second weight echoes along said entire scan line to form a composite scan line in an ultrasound image," as recited, for example, in claim 1 of the present application.

Further, Chiao does not teach these claim limitations, either. The Office Action cites Chiao at column 3, lines 18-29 as support for a "weighting factor for the entire scanline to form a composite scanline in an ultrasound image." The cited passage of Chiao, however, states the following:

> The transmit phases and the "slow-time" filter weightings are designed to selectively enhance the desired modes while suppressing others. In particular, a sequence of broadband pulses with different phases (and possibly different amplitudes) are transmitted to a transmit focal position over multiple firings, and the set of received beamformed signals are multiplied with a set of (possibly complex) scalar weightings before summing together that set of weighted beamformed signals for subsequent processing to form one image scan line. A complete image is formed by repeating this procedure for multiple transmit focal positions across the region of interest.

Chiao at column 3, lines 18-29. Notably, Chiao discloses multiplying a set of scalar weighting before summing together that set of weighted beamformed signals for subsequent process to **form** one image scan line. *See id.* Chiao, however, does not teach, nor suggest,

"summing first and second weighted echoes **along said entire scan line** to form a composition scan line," as recited, for example, in claim 1 of the present application. While Chiao does disclose "forming" an image scan line, it does not teach, nor suggest, "summing first and second weighted echoes along said entire scan line."

As noted above, Robinson does not teach, nor suggest, "summing first and second weighted echoes **along said entire scan line** to form a composition scan line." Similarly, Chiao also does not teach this limitation. Because neither Robinson or Chiao teach this limitation, the combination, by definition, also does not teach, nor suggest, this limitation. Thus, at least for this reason, the claims of the present application should be in condition for allowance.

In light of the above, the Applicants request reconsideration of the rejections of the pending claims of the present application and look forward to working with the Examiner to resolve any remaining issues in the application. If the Examiner has any questions or the Applicants can be of any assistance, the Examiner is invited to contact the Applicants. The Commissioner is authorized to charge any necessary fees or credit any overpayment to USPTO Account No. 07-0845.

Respectfully submitted,

Date: March 15, 2005

McANDREWS, HELD & MALLOY, LTD.
500 West Madison Street, 34th Floor
Chicago, Illinois 60661
Telephone: (312) 775-8000
Facsimile: (312) 775-8100

Joseph M. Butscher
Registration No. 48,326
Attorney for Applicants